

"The record of the application for the patent shows that the broadening aspect (in the reissue) relates to subject matter that applicant previously surrendered during the prosecution of the application. Accordingly, the narrow scope of the claims in the patent was not an error within the meaning of 35 U.S.C. §251, and the broader scope surrendered in the application for the patent cannot be recaptured by the filing of the present reissue application."

The relevant portion of the "broader scope" alleged to be "surrendered in the application" is as follows:

"... such that (i) outsides of ends of said membranes are sealingly secured to the headers in a closely spaced apart relationship, ...

The office action correctly points out the broadening aspect relative to the claims 1 and 9 of the '083 patent state, namely that the limitation:

"each said header having said fibers spaced apart by a flexible support means having a thickness corresponding to a desired lateral spacing between adjacent fibers, said support means extending over only each terminal portion of said fibers near their ends,"

is absent in the reissue application.

However, the office action fails to note that "so as to maintain said ends in closely-spaced apart relationship," is the essential requirement which patentably distinguished over the Kunio bundled. Yet the office action correctly states that the recitation of HOW that was accomplished in a very dense bundle of fibers, is what "gave their invention a clear advantage over the prior art".

Of course, since HOW this clear advantage was provided was not an aspect germane to the prior art rejection in the original application, is why this reissue application is a broadened reissue application.

The office action states:

"The proviso was added by amendment ... along with extensive argument of how the newly added limitation distinguishes the claimed invention over the prior art cited by the examiner. At p. 7 of that amendment, for instance, the applicants refer to the "flexible support means having a thickness corresponding to a desired lateral spacing

tube for carrying air to the through-passages and for spacing and positioning the lower and upper headers relative to one another.

18. The system of claim 17 wherein the air supply tube has additional through-passages along its length.

between adjacent fibers," as the "second essential element" which gave their invention a clear advantage over the prior art."

Though the office action points out that applicants, at page 7 of Paper No. 4, refer to the "flexible support means having a thickness corresponding to a desired lateral spacing between adjacent fibers," the office action fails to point out the context in which this is stated.

Applicants stated:

"Applicants discovered that if the fibers in an extended skein were not bundled, but *potted in spaced-apart relationship*, spaced apart by a flexible support means, there was no damage to the fibers over an extended period. Applicants discovered that with spaced-apart fibers in headers of an extended skein, in which skein the specified "slack" may be in a range wider than the range Kunio required for survival of his skein during backwashing, skein fibers will be immune to the damage suffered by Kunio's skein fibers, provided the ends of the fibers were potted in spaced-apart relationship in a header which was not rigid. As explained herebelow, there is no provision in Kunio for aerating his skeins during filtration, and it is clear he never intended to do so. It is self-evident (and affirmed by Kenneth Goodboy in his appended Declaration under 37 C.F.R. 1.132, numbered paragraph 8) that if the equipment Kunio used was incapable of disposing of air used for aerating the skein while filtering, Kunio could not suggest aerating the skein **while filtering**.

Accordingly, claim 9 has been amended to specify the first essential limitation ("slack") in the preamble, and to define the second essential element. This second essential element is the "flexible support means having a thickness corresponding to a desired lateral spacing between adjacent fibers" in the headers. Claim 1 is directed to the skein of amended claim 9 in combination with gas distribution (typically, aeration) means. Claim 13 is specifically directed to vertically gas-scrubbing the biers' (sic) outer surfaces while maintaining "clean" fibers and **simultaneously filtering** the substrate." (emphasis supplied in italicized text only).

These two "essential" elements provided the solution to the problem identified in the immediately preceding first full paragraph on pg 7 of Paper No. 4, which problem Kunio afflicted the ring-secured Kunio bundle, and which problem applicants were specifically addressing, namely forming a dense skein without damaging the fibers and without bundling the fibers as Kunio did.

The "error" in the patent is not that the fibers must be kept in spaced-apart relationship, and not bundled (the solution to the problem), but that a particular solution to that problem, namely, the one used by applicants in the best mode, was included in the amended claim. It is evident that that particular best mode solution was supplied because it maintained a dense skein of fibers in closely spaced-apart relationship, as opposed to fibers which were packed to maximum density, as in the Kunio bundle. Packing to maximum density resulted in contact of fibers with one and another. Such ring-secured maximum density was the cause of the problem; avoiding the problem required in a skein which was NOT as dense as the Kunio bundle, but dense enough if closely spaced-apart.

The office action fails to point out that the relevant portion of claim 1 originally presented in Ser. No. 08/690,045 (which resulted in the '083 patent) recited:

"said fibers being substantially concentrically disposed relative to the vertical axis between said headers;"

because applicants (who were not aware of the Kunio Japanese reference at the time) believed that the other essential element in combination with the "substantially concentrically disposed" element was sufficient to provide patentability.

This "other essential element" was that:

each of said fibers having substantially the same length, said length being from at least 0.1% greater, to less than 5% greater than said fixed distance so as to permit restricted displacement of an intermediate portion of each fiber, independently of the movement of another fiber;

The office action fails to recognize that providing a specific solution to the problem addressed in the Kunio reference cannot amount to "surrender" of claimed subject matter if that subject matter was never claimed.

Simply stated, the issue is: Did applicants give up the broader aspect of what they believed to be their invention when they submitted the above limitation in their amendment?

The office action refers to "extensive argument" in Paper No. 4, but fails to

note that this argument was directed to the Kunio reference Japanese Patent Application No. Sho 61 [1986]- 292045, because Kunio did not space them apart; not to HOW the fibers were spaced apart, which was the best mode of getting a dense skein with closely spaced-apart fibers. The argument included two declarations, one of Steven Pedersen and one of Kenneth Goodboy, which laid out the facts which showed that (i) Kunio used dead-end filtration with no provision for aerating a skein while filtering it; and (ii) to get a dense skein, Kunio bundled his fibers so that there was fiber-to-fiber contact.

Goodboy pointed out that Kunio addressed breakage of fibers during back-washing in a dead-end filtration system. Pedersen pointed out that damaging a single fiber out of 1000 in a skein is unacceptable.

The amendment (Paper No. 4) listed the problems Kunio addressed, to compare them to the problems addressed in applicant's simultaneous aeration and filtration system (see Paper No. 4, middle of pg. 9)

"These problems were summarized as follows:

- 1) greater restriction of excess length provides an insufficient bubbling effect;
- 2) in a dense bundle, flow to the fibers in the interior of the bundle is blocked;
- 3) solid material dropped off accumulates in the bundle."

It being obvious that the shorter the fiber, the less the length of fiber subjected to the "bubbling effect", both Kunio and applicants were addressing the specific problem of having to deal with (i) a "dense bundle" (to provide an economic advantage) and (ii) solid material which accumulates in the bundle.

Also obvious is that if the bundle was NOT a dense bundle, neither problem would arise.

Applicants conceded that "Such a method (using a bundle securing ring 7, as Kunio did) allows one to form a bundle with the maximum number of fibers within a cylindrical header, thus providing maximum filtration area for the number of fibers used in the bundle." (see middle of page 10) Then applicants pointed out "However, the problem with conventional "bundling" is that too many fibers are in contact with one another with varying degrees of 'tightness', more specifically, fluid-tightness. The

result is that when the bundle of fibers is potted, resin impregnates the bundle in direct proportion with the degree of fluid-tight contact between contiguous fibers. Where no resin is cured between fibers there is a likelihood that there will be fiber-to-fiber abrasion, and since the fibers are compressed (the walls of fibers are compressible), that the header holding the bundle will leak.

Reverting to the specification, it is evident that solution to the problem of a making and using a dense skein is the specific problem patentees addressed because of its economic importance. For example, in the first paragraph of the Summary of the Invention patentees state:

"In a skein of *densely packed fibers*, bubbles in such a configuration are more effective cleansing agents than bubbles which are intercepted by arcuate fibers crossing the path of the rising bubbles." (emphasis supplied, see printed '083 patent, col 2, line 66- col 3, line 3).

In the Detailed Description of Preferred Embodiments, applicants clearly

stated:

"The goal is to filter a slow-moving or captive substrate in a large container under ambient or elevated pressure, but preferably under essentially ambient pressure, and to *maximize the efficiency of a skein which does so (filters) practically and economically.*" (emphasis supplied, see printed '083 patent, col 6, lines 33-37).

In their description of Fig. 2, showing the best mode (stated at col 11, line 57), the patentees state what is essential about making and using a dense skein:

"Though the fibers 12 are not shown as close together as they would normally be, it is essential that the fibers are not in contact with each other, but that they be spaced apart by the cured resin between them. It is also essential that the potting resin adhere to and seal the lower portions 12' of each of the fibers against leakage of fluid under operating conditions of the skein." (emphasis supplied, see printed '083 patent, col 6, lines 33-37).

The limitation of HOW the fibers are maintained in spaced-apart relationship is unimportant in a sparse or non-dense skein where there are relatively few fibers in the skein. Obviously only a dozen fibers potted in a header the dimensions of a tea

cup would require no separating means, flexible or not. The limitation of "flexible" is obviously directed to the requirement of rolling an array to fit into a cylindrical header. This is why the limitation of

"said fibers being substantially concentrically disposed relative to the vertical axis between said headers;" was presented in the original claim. Just as obvious, the spacing means would not need to be rigid if the header was rectangular and multiple arrays were potted side-by-side.

It is evident from the arguments and declarations submitted in Paper No. 4, that using a flexible support means to keep the densely packed fibers in closely-spaced apart relationship was NOT what distinguished the invention described in the specification. It was simply the most practical and best mode known to applicants at the time, to keep a maximum number of fibers in spaced-apart relationship when they were to be potted in a cylindrical header, without any of the fibers being in fiber-to-fiber contact. Neither the shape of the header nor the means used to keep densely packed fibers spaced apart, flexible or not, was relevant to the patentability of the claims issued.

Studying, in greater detail, whether the applicants have met the statutory requirements of 35 U.S.C. § 251, it is clear that (1) they were addressing the problem of dealing with a dense bundle having a packing density of fibers, that is, the number of fibers per unit area of header, in the range from about 4 to 50 fibers/sq. cm. depending upon the diameters of the fibers" used (see printed '083 patent, col 7, lines 33-34) ; and (2) that merely alleging that applicants could keep a bundle of densely packed fibers spaced apart with a center-to-center spacing "preferably in the range from 1.2 (1.2d) to about 5 times (5d) the outside diameter "d" of a fiber" (see printed '083 patent, col 7, lines 29-30), without stating how they intended to do this, would not only fail to state the best mode they knew of at the time, but would fail to provide the enablement required by 35 U.S.C. § 112.

Reverting to Paper No. 4, disregarding the fact that Kunio did not suggest scrubbing fibers while filtering, and that Kunio used air to blow the fibers clean from

within, applicants arguing the problem with the Kunio bundle of fibers being held with a securing ring 7, pointed out

"However, the problem with conventional "bundling" is that too many fibers are in contact with one another with varying degrees of 'tightness', more specifically, fluid-tightness. The result is that when the bundle of fibers is potted, resin impregnates the bundle in direct proportion with the degree of fluid-tight contact between contiguous fibers. Where no resin is cured between fibers there is a likelihood that there will be fiber-to-fiber abrasion, and since the fibers are compressed (the walls of fibers are compressible), that the header holding the bundle will leak. The proclivity to leak is exacerbated when the fibers are of polymer and therefore radially compressible. In operation, these fibers which are contiguously bundled (touching each other in the bundle), chafe against each other as they sway. Such chafing simultaneously weakens the walls of the fibers and increases the likelihood of leakage of substrate between them, the substrate getting into the permeate collection system. Note that Kunio states:

"2) When the hollow yarn membrane filter 2 is bundled in the aforesaid way in a condition in which multiple pieces of hollow yarn 2a are densely arranged, . . ." (see page 4, lines 12-13)

Applicants discovered how to solve the problem by **avoiding bundling** the fibers in contact with one and another. They sacrificed density of fibers to obtain better longevity (no fiber-to-fiber abrasion) and a leak-proof header. They did so by supporting spaced-apart fibers on a flexible support of desired thickness before potting the fibers, thus assuring a chosen spacing (specified by the center-to-center dimensions) between fibers in the header, and assuring the penetration of resin between every fiber. This additional limitation has been introduced into the amended article claims to the skein. (see Paper No. 4, bridging pages 10 and 11, emphasis in the original).

Looking to the prosecution history of the '083 patent for arguments and for changes to the claims made in an effort to overcome the prior art rejection, it is clear that the scope of the claim which was patentable was that very densely packed fibers could positively be kept spaced-apart when they were potted. Nothing in either the rejection or the arguments and changes in the claims was directed to fibers which were NOT densely packed for the simple reason that the problem would not then arise.

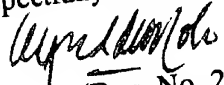


The record shows that applicants never surrendered the essential aspect of "closely spaced-apart" fibers which is still maintained in their invention.

It is plain that the limitation of "flexible support means having a thickness corresponding to a desired lateral spacing between adjacent fibers, said support means extending over only each terminal portion of said fibers near their ends," was not introduced to obtain allowance of the original patent claims. Therefore this subject matter could not have been surrendered.

In view of the foregoing remarks, arguments, and amendments to the specification and the claims, it is respectfully submitted that the basis for the rejection of claim 15 has been overcome and that the claim is now in condition for allowance. Since claims 16 - 18 depend from claim 15 and more narrowly define the invention, they too are allowable.

Respectfully submitted,

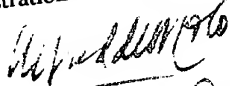
  
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CERTIFICATE UNDER 35 U.S.C. 1.8(a)

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## APPENDIX

15. (Amended) A system for treating a multicomponent liquid substrate while leaving particulate matter therein, comprising,

(a) a non-pressurized reservoir other than a shell of a module for containing the substrate;

(b) a cylindrical skein of hollow fiber filtering membranes immersed in the substrate each fiber having a length greater than 0.5 m, the fibers together providing a surface area at least greater than  $1 \text{ m}^2$  and disposed generally vertically between upper and lower cylindrical headers such that (i) outsides of ends of said membranes are sealingly secured to the headers in a closely spaced apart relationship, (ii) lumens of said fibers being in fluid communication with at least one permeate collection means, and, (iii) said fibers having a length between opposed surfaces of the headers, in the range from 0.1% to 5% greater than the distance between opposed surfaces of the headers;

(c) a pump in fluid communication with said lumens of said membranes through at least one permeate collection means, said pump operable to apply a suction to the lumens of the membranes to draw a component of the substrate as permeate through said membranes while leaving particulate matter in said substrate; and,

(d) aeration means having through-passages with openings, distributed both radially and circumferentially within the Skein for discharging air directly into the substrate near the base of the skein, the openings providing a column of bubbles rising from near said outsides of said membranes' lower ends.

16. The system of claim 15 wherein the length is in the range from 0.1% to 1% greater than the distance between the opposed surfaces of the headers.

17. The system of claim 16 wherein the aeration means includes a rigid air supply